

and in pathological or abnormal processes. In fact the one is a supplement to the other, and probably neither is able to exert its full activity without the simultaneous cooperation of the other.

(1) The first book under review comprises courses of lectures delivered by Prof. Starling at University College under the auspices of the Mercers' Company, at the Bellevue Hospital, New York, under the foundation of Dr. Herter, and at the Royal College of Surgeons. It is written in a simple and attractive style, and gives an admirable description of such subjects as the physical properties of protoplasm, the osmotic relationships of cells, the intake, exchange, absorption, and output of fluids in the body, and the production of lymph (the fluid which bathes the tissues), and the relationship of these normal processes to disease processes, such as dropsy. Many important physical and chemical conceptions, such as osmotic pressure, adsorption, the nature of colloids, surface tension, and the like, are here brought together and explained, and their relation to vital processes is examined. In the discussions of the connection between normal and pathological processes many suggestions of value to the medical practitioner are made. Thus the regeneration of the constituents of the blood after bleeding is considered to be due to the stimulus of lack of oxygen, and the value of occasional blood-letting is compared to that of a sojourn at high altitudes, the beneficial and recuperative effects of which are well recognised, and it is suggested that the practice of *occasional* blood-letting may be restored to the position of honour it once held in medical practice.

(2) The second book includes numerous papers contributed by Sir Almroth Wright, his co-workers, and friends to various journals and societies, and deals more or less directly with the problems of immunisation against disease-producing micro-organisms. The first part of the book deals primarily with the protective elements of the blood, agglutinins, bactericidins, and opsonins; in the second part the problem of fighting bacterial infections by those defensive agencies which the organism itself employs when it contends with microbic invasions, is discussed. The formation of a book by a collection of separate papers, collated together though they be to some extent by numerous foot-notes, necessarily leads to a certain amount of repetition, and to a somewhat irritating use of cross-references. Nevertheless, all workers in this field of research cannot but be grateful to Sir Almroth Wright for thus bringing together and rendering accessible a number of scattered papers.

Opsonins and vaccine therapy necessarily occupy a prominent place. Opsonins are substances present in the blood which act upon invading microbes, and render these susceptible to phagocytosis, that is, to ingestion by certain amœboid, wandering, and other cells, which brings about their destruction. By the injection of a certain quantum of a killed bacterial culture the production of opsonins specific for the particular organism injected tends to be increased; phagocytosis of the organism in question therefore is also rendered more active, and if an infection with the

organism exists, it tends to be got rid of. The use of bacterial vaccines has been successful or useful in many infections; this is vaccine therapy. The present-day employment of vaccine therapy must in the main be ascribed to the work of Sir Almroth Wright, his co-workers and pupils, and to them all honour is due. At the same time we cannot help thinking that to some extent a balanced perspective is wanting in some of the statements. Thus the condemnations of the antiseptic system, and of the value of surgical extirpation of infective foci, are too wide and sweeping (pp. 280 and 318). The same criticism applies to the remarks on serum therapy (pp. 300 and 321).

Whatever be the failures of serum therapy, we cannot help thinking that neutralisation of the existing "poison" *at the moment* is a goal to be aimed at, however much we strive to reinforce the defensive powers of the body and render it later able to take care of itself. In very acute infections, such as some forms of septicæmia, which may prove fatal in twenty-four to forty-eight hours, or in cholera, in which the patient may be dead in a few hours after the commencement of the attack, the direct neutralisation of the "poison" would seem to be the only treatment that affords hope of success. The comparative failure of serum therapy should therefore be a stimulus to the elaboration of new methods of preparation of therapeutic serums rather than an argument for considering serum therapy futile.

TEXT-BOOKS OF PHYSICS.

- (1) *Heat and other Forces.* By Colonel W. F. Badgley. Part i.: "Heat"; part ii.: "Physical Forces." Pp. 221+vi. (London: King, Sell and Olding, Ltd., 1907.) Price 5s. net.
- (2) *An Elementary Course in Practical Science.* By C. Foxcraft and T. Samuel. Part i. Pp. 48. Part ii. Pp. 58. (London: G. Philip and Son, Ltd., n.d.) Price 6d. net each.
- (3) *Horbare, Sichtbare, Elektrische und Röntgen-Strahlen.* By Dr. Friedrich Neesen. Pp. 132. (Leipzig: Quelle and Meyer, 1909.) Price 1.25 marks.
- (4) *An Elementary Text-book of Physics.* By Dr. R. W. Stewart. Part ii.: "Sound," pp. iii+141. Part iii.: "Light," pp. vii+219. (London: C. Griffin and Co., Ltd., 1909.) Price, part ii., 2s. 6d. net; part iii., 3s. 6d. net.

(1) COLONEL BADGLEY'S book is an extraordinary production. The contents might be guessed from the title, which implies that heat is a force. The author has evidently read a great deal of current scientific work, to which he frequently refers, but has not the exact knowledge necessary for writing on the subject. Indeed, he suggests that the differences between work, energy, power, force, and motion are only mythical, and that the terms are really interchangeable. Typical, also, is the statement that "the heat given off by the spontaneous decomposition of radium is, perhaps, about a degree and a half centigrade." The preface is very cynical. It is questioned whether men of science believe in one

another's discoveries, and hinted that few of the latter are worthy of acceptance. The main object of the book is said to be to try to prove that "heat is not a vibration of material, not even of aether," but we search in vain for a clear alternative definition. It is a difficult book to follow because of the entire lack of order. The whole is an intricate mixture of simple experimental facts, quotations from books on many subjects, some of which are very remotely connected with heat, and a large amount of astounding new theory. Most of the ordinary phenomena in heat are dealt with, and a chapter in defence of the British systems of measurement is included. We can neither recommend the book to beginners—for it would confuse them—nor to those conversant with the subject—for it would waste their time.

(2) The two little books on practical science are for use in elementary schools, and the authors claim that the scheme has already been thoroughly tested with success. Part i. consists of a series of exercises in measurements of length, area, volume, weight, and density. Part ii. contains rather more advanced exercises on the same subjects, together with some on atmospheric pressure and heat, and a suggested course of woodwork. The exercises do not consist of detailed instructions of what to do and expect, but require some initiative on the part of the student. This is, indeed, the intention of the authors, who hold the view that the pupil should discover facts for himself. Thus, some of the exercises simply consist of a series of questions to be answered by making experiments. The books, although cheap, are clearly printed, and will probably be found to serve their purpose.

(3) Dr. Neesen has undertaken a difficult task in dealing with such a large subject in so small a volume. Nevertheless, most of the phenomena proper to the various subjects are referred to, although briefly. With a few exceptions, the book is non-mathematical, and deals rather with the experimental side. The reader, therefore, has no need of an advanced knowledge of physics, and it is doubtless advantageous for such to study the different kinds of wave motion together. Besides the subjects mentioned in the title, there are several paragraphs on radioactivity, in which the properties of the α , β , and γ rays are dealt with. Many of the diagrams are poorly drawn and printed. This is particularly unfortunate in a book dealing with wave motion and geometrical optics.

(4) Quite otherwise in this respect are the two textbooks of physics by Dr. Stewart. That on sound especially should supply the much-felt need of an elementary treatment of that subject. Exception may be taken to the definition of simple harmonic motion as the projection on a diameter of the uniform circular motion of a point, because it leads students to believe in the existence of such a point in all cases of simple harmonic motion. It is rather surprising, also, to find Doppler's principle and the production of beats not referred to, especially as the latter is so commonly used as a method of estimating frequencies. Omissions are the chief fault in these volumes, and they are even more frequent in the part on light. There is no treatment of microscopes and telescopes,

nor the methods of measuring the velocity of light. These are surely not out of place even in an elementary text-book. In reading this part alone it is noticeable that the undulatory theory is not sufficiently insisted upon, but this is compensated for by the fact that the laws of refraction and reflection are proved according to this theory in the volume on sound. On the whole, however, the books are distinctly good, and the large number of experiments suggested will no doubt serve to demonstrate the principles involved.

VOLUMETRIC CHEMICAL ANALYSIS.

A Manual of Volumetric Analysis. For the Use of Pharmacists, Sanitary and Food Chemists, as well as for Students in these Branches. By Dr. H. W. Schimpf. Fifth edition, revised and enlarged. Pp. xx+725 (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1909.) Price 21s. net.

THE plan of this work is as follows:—First, the general principles of volumetric chemical analysis are explained and illustrated. Next, the knowledge thus gained is applied to practice-work upon the commoner inorganic elements and their chief compounds, and upon certain organic acids. Finally, two branches of specialised work are taken up—namely, the analysis of various food-stuffs and pharmaceutical products—and the book concludes with a few examples of gasometric analysis applied to articles met with in pharmacy and medicine.

The treatment is generally fairly exhaustive, and the descriptions lucid. Often, indeed, the author gives almost a superabundance of detail in explaining the principles of the methods used. For example, he supplies not only the equations involved, but frequently the arithmetic as well. In the early part of the book he appears to have in mind the very elementary student, and is at some pains to explain such matters as the law of definite proportions. This seems hardly necessary in a book of this character. Knowledge of the elementary principles on the part of the student might well be taken for granted. In fact, the author is scarcely consistent; a page or two later on we find ourselves talking of univalent and divalent compounds, monobasic and dibasic acids, without previous explanation of the terms. A reader who knows what they mean would not be likely to want an exposition of the law of definite proportions.

A very useful description of the properties of indicators is contained in the fourth chapter. The reactions involved are dealt with mainly as ionisation phenomena, but a brief explanation is given of the chromophoric theory also.

The special feature of the volume, however, is the amount of attention devoted to the assaying of pharmaceutical preparations, particularly alkaloidal drugs. No fewer than a hundred and fourteen pages are taken up with these, and the sections appear to have been brought well abreast of modern practice. One division treats of the general volumetric estimation of alkaloids, explaining the principles, and describing some of the newer methods, as well as those which are older and better known. Afterwards comes a